



American Society of  
**Anesthesiologists™**

Central Line

Episode Number: 89

Episode Title: New Findings Related to Maternal Morbidity and AKI

Recorded: February 2023

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VOICE OVER:

Welcome to ASA's Central Line, the official podcast series of the American Society of Anesthesiologists, edited by Dr. Adam Striker.

DR. ADAM STRIKER:

Welcome back to Central Line. I'm Dr. Adam Striker, your host and editor. Today we're talking to Dr. Destiny Chow, editor for Summaries of Emerging Evidence, or, as commonly is known, SEE. I want to talk about a few of the findings explored in the current issue. One is we're going to discuss the role of hospital level factors on maternal morbidity as it relates to racial disparities. And then secondly, we're going to talk a little bit about monitoring urine oxygenation and how it addresses acute kidney injury. So a lot to get to today. Kind of a potpourri of topics, if you will. So let's get started. Doctor Chau, welcome to the show.

DR. DESTINY CHAU:

Thank you very much. I'm so glad to be here.

DR. STRIKER:

Well, before we get to the clinical content, let's have you tell our listeners just a little bit about yourself and how you got involved with the SEE program. And then maybe just explain a little bit about what the SEE is.

DR. CHAU:

Yes, I am a pediatric anesthesiologist and I have been on the editorial board for SEE for a few years now. And how did I come about to writing for SEE was through some colleagues of mine who were writers for SEE. They loaned me some of those volumes to read, and it was I was intrigued by the content. So I started to be a question writer for SEE. It's really enjoyable. And writing on new literature for SEE is a really it's a process that for me is very intellectually stimulating. Importantly, it keeps me professionally

abreast of important new literature that comes up, especially in areas in anesthesia that is outside of what I do now, day to day. Besides getting engaged on what is new in terms of continuing medical education also it's really fun to be with a group of like-minded people who are striving to make these questions really interesting for our profession.

DR. STRIKER:

And so this is a continuing education platform that focuses on what the organization feels is important literature that's out there currently. Is that is that right?

DR. CHAU:

That's right. SEE is short for Summaries of Emerging Evidence. So it's a self-study, continuing education that actually has been around for about 40 years. And it highlights current important findings for more than 30 scientific medical journals. Those articles are curated to a few that really impacts and can improve the current practice of our field, includes a wide range of related specialties in anesthesia, but also on related fields that might be changing our practice. SEE is actually is in a question answer format similar to ACE. Nevertheless, because the content is new, the question and answer format is are intended to pique our interest, not really to test our knowledge. So with each question, their discussions and their references that are already summarized and set every key points of each study, which allows for the reader to go into further study if they're interested. So SEE has publishes about 100 questions twice a year for a total of 200 per annual subscription, so it gives the reader 60 category one credits per year.

DR. STRIKER:

Gotcha. All right. Well, let's get on to the clinical information and we'll start off by talking about the hospital level factors on severe maternal morbidity rates as it relates to racial and ethnic disparities. Those who listen to the show frequently will know that obstetrical care is one place disparities are particularly apparent. And black women have higher rates of mortality and severe maternal morbidity than than white women. And if I'm not mistaken, maternal mortality and morbidity rates in the US have more than doubled in the last 30 years. And studies have focused on patient level disparities. But if I understand this correctly, this recent study shifts the lens to look at hospital level factors as opposed to patient level factors. For instance, things like the hospital's percentage of deliveries of black mothers and safety net burden, etc. But why don't you go ahead and tell us a little bit about this study?

DR. CHAU:

Yes, as you have mentioned, most studies are focused on patient level factors to the health outcome disparities, especially in OB patients. They are much fewer studies on hospital level factors. So this study fills a really important gap in our quest to find out how we can mitigate this disparity.

So this recent analysis wanted to find out, first of all, the role of the hospital level factors on severe maternal morbidity, not mortality, but severe maternal morbidity, which is defined as the presence of one out of 21 very serious obstetric complications such as acute renal failure, pulmonary edema, sepsis, hysterectomy, eclampsia. So not just to evaluate the role of hospital level factors on maternal morbidity, but also how those factors interact, those two-level factors, the hospital level and the patient level factors interact together. This study focus on data that came from hospitalizations for delivery in patients who were older than 18 years of age from the state inpatient databases, which is a really large database that captures a lot of hospital admissions from the years of 2007 to 2014 for five states. And those states were chosen because they were considered to be geographically and demographically diverse, hoping that to be representative of the country. Those states were California, Florida, Kentucky, Maryland and New York.

So they chose two hospital level factors. One were the black serving delivery units. And another hospital level factor, whether the hospital was a safety net, hospital, what burden they have for a safety net. So a high black serving delivery unit was defined by the authors as a top fifth percentile based on deliveries to black women, while a median black serving delivery unit define at the top 5 to 25th percentile and the low black serving unit was on the bottom 75%. So it was a three tier hospital factor based on black serving delivery units. Now, the hospital safety net burden was determined by the percentage of patients treating the hospital who had either Medicaid insurance or no insurance. And this safety net burden hospital were also divided into low, mid and high. They study patient level factors and the main one was race and ethnicity. The other patient level factors that were also included included things like median income and such. So this study included more than ... close to 7 million deliveries from 707 hospitals into the analysis.

And very interestingly, after they adjusted for patient level factors such as race and median income, the risk of severe maternal morbidity was greater in women who deliver in high black serving units and median serving units compared to those who deliver in low serving units. So those are a whole bunch of words together. But basically what it means is that all women did worse on those hospitals that had more black women as patients. So this obviously suggests inter hospital disparities. So now when you look at the other hospital level factor, which is the hospital safety net burden, they found that

interestingly, it was not associated with severe maternal morbidity. Now, as far as the interaction between the hospital level and the patient level factors, black women fared the worst at all levels. Basically, if you are a black woman, no matter where you go, which delivery unit category, whether it's highest serving, low serving, middle serving or high middle or low safety net hospital, they had a higher rate of severe maternal morbidity than white woman. So those are the main findings.

DR. STRIKER:

Okay. Well, why?

DR. CHAU:

Why? Yes. Why? The short answer points to structural racism as a key driver to the social determinants of health for black pregnant women. We live and work in a system that normalizes such health inequities to a point we don't even notice them unless we pause and take a close, honest look. We all show up to work every day wanting to make a positive, meaningful impact through the work we do. And none of us wish to contribute to the health disparity. However, we all come with personal unconscious biases that are part of our personal human stories. And in fact, the pediatric literature reveals that apparently healthy black children have poorer outcomes and higher mortality after surgery, compared to white children, suggesting systemic level factors as contributors. And this study adds to the evidence of hospital level characteristics augmenting outcome disparities. In light of this knowledge, what are we to do? While changes in multiple fronts are essential, each of us have the personal responsibility to maintain awareness of the poorer patient outcomes at the intersections of black race, female gender, and systems factors. To not assume that these patients have a safety net, to go the extra mile within our capabilities and sphere of influences to see that they do not fall through the cracks. I believe these small individual changes can be collectively really powerful.

DR. STRIKER:

Did the study allude to anything, any specifics that would be a natural next step of investigating specifically.

DR. CHAU:

Not necessarily, although it did come up with something interesting as to the safety, the hospital safety net burden. Because some studies show that those safety hospitals that has high burden of uninsured patients, Medicaid patients have poorer outcomes. In this

study did not show that across the board, although black women still feared the worst. So the question comes, you know, why is that? Is because that's Medicaid has a factor on that. You have uninsured patients and you have Medicaid patients. So looking to where government policies can lower the disparities in that sense. That was one of the points that it was discussed by the authors in this article.

DR. STRIKER:

Okay. Gotcha. Well, this is obviously an incredibly important topic and a very significant one in terms of the breadth of where we might go to try to figure out solutions from here. I certainly hope this triggers some some more targeted studies, if you will.

DR. CHAU:

Yes, absolutely. We need to do that. We need to move in that direction more.

DR. STRIKER:

Well, I do want to get to the next topic, which is acute kidney injury. But before we do, let's take a short patient safety break.

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DR. SCOTT WATKINS:

Hi, this is Dr. Scott Watkins with the ASA Patient Safety Editorial Board.

Nothing strikes fear in the hearts of anesthesiologists more than the difficult airway, except perhaps the pediatric difficult airway. The physiological difference in oxygen consumption between adults and children are well known to all anesthesiologists, so it will come as no surprise that the most common complication involving pediatric airway management is de saturation or hypoxemia. The use of passive oxygenation by nasal cannula that flows as low as 0.2 liters per kg per minute significantly increases the time to de saturation during airway management. This benefit is found with little to no discernible downside, suggesting that passive oxygenation via nasal cannula should be considered any time a potentially difficult pediatric airway is encountered. This is one way to improve the overall safety and success of airway management.

VOICE OVER:

For more information on patient safety, visit [asahq.org/patientsafet22](http://asahq.org/patientsafet22).

DR. STRIKER:

All right. Well, we're back with Dr. Chao discussing the current issue of **SEE**, And we want to talk about acute kidney injury, certainly very common and certainly associated with serious adverse outcomes after a major surgical procedures. Before we get into details, do you want to talk a little bit about why anesthesiologists take acute kidney injury so seriously?

DR. CHAU:

Well, acute kidney injury is a common complication, and that is linked to increased mortality and morbidity and decreased quality of life. Now, with our aging population and specifically with cardiac surgeries and other major procedures that this group of patients undergo, they are exposed to high risk for acute kidney injury in the post-operative period. It is important for us to be aware of it because currently there's not a lot of time sensitive methods that we can use to identify those patients who are experiencing that. And for us to be able to find a way to be able to diagnose the development of worsening renal function is key for us to be able to implement mitigation strategies.

DR. STRIKER:

Well, monitors that target organ specific well-being are certainly essential for keeping patients safe like the myocardial monitors is a good example. But we haven't found or had a real time monitor of renal well-being. But if I'm not mistaken, a recent study uses a prototype monitor to measure oxygen partial pressure in the urine at the point of exit from the urinary catheter. Can you talk a little bit about that study and what it found? And then certainly touch on on how we can use that to improve patient outcomes if we can?

DR. CHAU:

Yes. This study was a prospective observational pilot study and they wanted to test out this device that the author had put together. And this device measured urinary oxygen, partial pressure, and they used it during and after cardiopulmonary bypass. It's a urinary oximeter. It was placed between the urinary catheter and the urinary collection bag. So obviously, this oximeter is noninvasive and it continuously measures anterograde urine flow and that gives oxygen partial pressure and gives a temperature.

DR. STRIKER:

Okay. Urine oxygenation is a good perioperative AKI or acute kidney injury biomarker candidate. Talk about the evidence linking that to real time kidney well-being.

DR. CHAU:

So I think like any other organs, I think there is an intuitive principle which makes sense that decreased oxygen delivery and hypoxia are usually direct contributing factors to organ failure. So having a monitor as a surrogate, it provides a level of measurement of oxygenation of what comes out through the urine. So one step closer to the degree of oxygenation that that organ is receiving. So the thought here is that if oxygen delivery to the kidneys are adequate and that that will be reflected on the partial pressure of the urine that comes out through the urinary catheter. So, so far, we haven't really had a practical, feasible way to measure that in real time. So this seemed to be more of a more direct measure of the function of this organ in real time than other products out there.

DR. STRIKER:

So the idea being that if the partial pressure is low, that suggests that more oxygen has been extracted and hence the kidney is potentially in danger.

DR. CHAU:

Yes. Or, you know, that oxygen delivery to the organ is to start with is low. It's an or and and, right? The total outcome is low is because there's more demand. I would say there's less supply with the same demand or increased demand.

DR. STRIKER:

Right. So the same principle that we we talk about theoretically with measuring tissue oxygenation, if you will, that.

DR. CHAU:

Yes, Yes. So with the tissue oxygenation we put that is a it's a same concept. It's a it's a surrogate measurement. Right. In real time.

DR. STRIKER:

Okay. So then what's the takeaway? What do the results actually show? Is it does it show a strong correlation? Is it associated with better outcomes or what?

DR. CHAU:

Yes. So when this group of authors, they use this prototype in a total of 86 cardiac surgical patients undergoing cardiopulmonary bypass, and they actually included those who had the highest risk for acute kidney injury, and they measure that during CPB and post operatively. So they were able to capture data for those patients who had urinary flow rates greater than 0.5 cc's per kilo per hour, just because the investigator postulated that lower flow rates will be a confounding variable there. So the rate of acute kidney injury was the primary outcome. And what they found is that just like you had intuitively concluded, that basically mean urinary oxygen partial pressure in that post bypass period was actually much lower in those patients who later developed acute kidney injury than in those who did not develop acute kidney injury. So they found that after the analysis there was an 18% risk reduction of acute kidney injury for every ten millimeters of mercury increase on the urinary oxygen partial pressure. So that correlation was there when they did the final analysis.

The other interesting finding was that this one was detected in real time where if you go to the traditional ways to diagnose acute kidney injury through serum creatinine, that was not elevated above the threshold for the diagnosis and post op number two. Basically there is more immediate measurement and immediate detection per say or correlation. So don't have to wait two days before knowing that this patient will go into acute kidney injury.

DR. STRIKER:

Well, certainly sounds promising. That would be incredibly useful. What is the current feasibility of something like that, if that were to be shown to be truly effective in preventing acute kidney injury?

DR. CHAU:

I will say, first of all, more than preventing more at this stage where detecting or identifying those at risk for it. The prototype is not on the market, but it doesn't appear to be too complicated from what the authors describe it to be. They still have to work through their challenges, and one of those is the limitation that you had to have urine flow for it to be able to work. In this study, they used urinary output of more than 0.56 per kilo per hour. That is a challenge. You have to have integrate urinary flow that is above the level and they just pick the number arbitrarily, mainly. So more study they need to be done in order to refine the device and also define with larger study what

really constitutes those levels at which that to make those predictions. So the final monitor might not be available for some time, but so far this is looking promising.

DR. STRIKER:

Yeah, the idea of a real time monitor, presumably to allow for some kind of action to be taken to help prevent the acute kidney injury, even if you identify the patients at risk, the idea being we somehow can stave it off.

DR. CHAU:

Yes. If we are able to say, well, you know, the numbers look bad and it's looking like this patient is developing acute kidney injury, there are things that we can do, right. We can increase the the arterial pressure on bypass, might increase oxygen delivery capacity by giving increase in the hematocrit. So there are several things that we can do in the hopes of mitigating that outcome.

DR. STRIKER:

Yeah, no, certainly. Well, this is it's certainly exciting to think about the prospect of something like that. Similar as you pointed out, to Nears and how we use it now during during cardiac surgery.

Well, before I let you go, I wanted to ask if there's anything our listeners should know about this particular issue of SEE beyond what we've covered so far with the two topics today.

DR. CHAU:

Yeah, I've been biased that I really like this product. I really like SEE I think all items are really good, but it's one particular one that I think has high impact in the anesthesia field. And this is a new guideline. SEE does publish new IND updates of guidelines. So the recent one is by the American Heart Association and American College of Cardiology, which updated their joint practice guideline for the management of heart failure. As you know, we take care of a lot of patients who are at risk for heart failure or are in heart failure who presents to our operating rooms on a daily basis. So this new guideline is a major change in the management of heart failure. It heavily stresses the inclusion of this group of drugs, the sodium glucose cotransporter two inhibitors, and you might see that with the with the acronym the SGLT2I and drugs such as EMPAGLIFLOZIN or Impact GLE flows in CANAGLIFLOZIN and DAPAGLIFLOZIN. I mean, those are the group of drugs that the guideline is recommending for patients in all classes of heart failure,

including the prevention of heart failure in at risk patients. So this group of patients will be coming to our ORs. With these new medications. And, and actually, around the time of this guideline's release, the FDA released a warning to health care professionals to consider stopping these medications at least three days preoperatively because of the risk of ketoacidosis after surgery. So this information really relevant to our field. More and more patients, I'm actually seeing them coming through our ORs. We need to be aware of it.

DR. STRIKER:

Well, Dr. Chau, thank you so much for joining us today. And this has been a great conversation. Fascinating topics, and certainly important ones. And I can't wait to check out the current issue. Is there an easy way for our listeners that want to check out the SEE program to access it?

DR. CHAU:

Yes. At the ASA website, it is under the education tab. They can look for the SEE product. Subscription can be done online and they can access those questions online via the website or via an app that they can actually respond. They can go through the questions on their phone, in their app during whatever time, wherever they are. This is a very practical way to keep up with emerging knowledge related to anesthesia and other fields that impacts our professional work day to day.

DR. STRIKER:

Yeah, absolutely. So very important work and a great resource.

DR. CHAU:

Yes.

DR. STRIKER:

Well, excellent. And our listeners, thanks for tuning in to this episode of Central Line. Please come back in a few weeks and we'll see you then. Take care.

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